46 30
~~49~~. (New) The servo-control circuit for tuning a laser signal generator as claimed in Claim ~~30~~, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for modifying the bias signal to obtain an optical signal having a wavelength respectively less than or greater than said desired wavelength of said bandpass filter means according to a desired application.

47
~~50~~. (New) The servo-control circuit for tuning a tunable wavelength selective device as claimed in Claim 37 ~~38~~, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for modifying the passband wavelength respectively less than or greater than said center wavelength of said tunable wavelength selective means according to a desired application.

An
land

48 38
~~51~~. (New) The method for tuning a laser signal generator as claimed in Claim ~~40~~, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for modifying the bias signal to obtain an optical signal having a wavelength respectively less than or greater than said desired wavelength of said bandpass filter means according to a desired application.--

REMARKS

Favorable reconsideration and allowance of the claims of the present application, as amended herein, is respectfully requested.

This Amendment is filed in reply to the outstanding Official Action of

 G:\ibm\1111\14401\AMEND\14401.am1.doc

November 15, 2002 and it is believed to be fully responsive to the Official Action for reasons set forth herein below in greater detail.

As a preliminary matter, in the Office Action the Examiner rejected Claims 1-44 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Particularly, the Examiner specifically mentions Claims 1, 18, 30 and 38 as repeatedly reciting elements as a "device" and/or a "mechanism" and that this lack of consistency rendered the claims vague, indefinite and confusing, warranting the §112, second paragraph rejection. In response, applicants amend each of independent Claims 1, 18, 21, 28, 30, 38 and 40 to obviate these rejections and avoid any potential confusion between claiming a device or alternately a mechanism. For instance, instead of claiming a wavelength selective device, applicants set forth this element as a <u>wavelength selective means</u>. Further more, Applicants amend each of independent Claims 1, 18, 21, 28 and 38 to set forth this element in proper "means for" language (in compliance with 35 U.S.C. §112, sixth paragraph) by setting forth a <u>wavelength selective means for</u> implementing a peaked passband function including a center wavelength. Likewise, Claims 30 and 40 are being amended to set forth a bandpass filter "means for…". It is respectfully submitted that each of amended Claims 1, 18, 21, 28, 30, 38 and 40 set forth elements clearly and definitely, and that the claim recites sufficient structure and interrelation of elements contrary to the Examiner's contention. Thus, respectfully, the Examiner is requested to withdraw the §112, second paragraph rejection of independent Claims 1, 18, 21, 28, 30, 38 and 40 and all claims directly or indirectly dependent thereon.

More substantively, in the Office Action, the Examiner rejected Claims 1-3, 5-9, 11-30, 32-38, 40 and 42-44 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,221,861 to Kuo et al. ("Kuo"). The Examiner further rejected Claim 4 under 35 U.S.C. §103(a) as being unpatentable over Kuo in view of U.S. Patent No. 5,340,980 to Bianchini et al. ("Bianchini"); rejected Claim 10 under 35 U.S.C. §103(a) as being unpatentable over Kuo in view of U.S. Patent No. 6,333,941 to Hung ("Hung"); and, further rejected Claims 31, 39 and 41 under 35 U.S.C. §103(a) as being unpatentable over Kuo.

Generally, in the Office Action, the Examiner alleges that Kuo teaches a method and apparatus for controlling the wavelength of a laser that allegedly includes elements such as a laser transmitter (100) for generating a laser signal (112), a modulator (114), an optical filter (120), an optical detector (122) a wavelength control circuit (130) a dither signal generator (218) a wavelength conversion element (222) a loop filter (216), and additionally ADC/DAC converters (214, 224), amplifier (212), and an error signal (410) wherein the frequency spectrum (310, 312) of the modulated optical signal is shown.

Applicants respectfully disagree. The Examiner's rejection of Claims 1, 8, 21, 28, 30, 38 and 40 throughout most of the office action is based on a fundamental assumption regarding similarities between the present invention and the laser wavelength control device of Kuo et al. While the apparatus and several of the basic components described by Kuo appear superficially similar to the apparatus described in the present invention as claimed, for example, a laser, modulator, optical splitter, filter, and

photodetector, a closer reading of Kuo will show that this prior art is based on a fundamentally different principle of operation, and, contrary to the Examiner's allegations, as will be addressed herein, it is respectfully submitted that there are significant differences which distinguish the present invention over the work of Kuo.

Fundamentally, the present invention as claimed in independent Claims 1, 8, 21, 28, 30, 38 and 40 is directed to the various embodiments of an apparatus and methodology implementing the principles of the wavelength locked loop for an optical system which enables real time alignment and tracking of any spectral device that selects a wavelength. The principle of operation of the wavelength locked loop for an optical system of the present invention, is the use of a servo mechanism capable of generating a frequency doubled error signal when the laser and bandpass filter or wavelength selective device center wavelengths are congruent. Each of the independent Claims 1, 18, 20, 28 set forth and Claims 30, 38 and 40 have been amended herein to set forth the phenomena that when a frequency characteristic of the feedback (error) signal is two times the dither modulation frequency, the wavelength of the optical signal, e.g., a laser, exactly matches (or becomes aligned with) the desired wavelength of the wavelength selective means (e.g., bandpass filter). As will be explained herein, integral to this wavelength locked loop principle is the generation of an error signal which comprises a vector cross product of the feedback signal and a dither modulation signal and which yields frequency doubling.

Consequently, each of independent Claims 1, 18, 20, 28,30, 38 and 40 have been amended to set forth the element and method step for generating an error signal

which comprises a vector cross product of the feedback signal and a dither modulation signal. Additionally, dependent Claims 11, 25, 35 and 42 have been amended in a fashion commensurate with the amendment to their respective base claim.

Thus, in a first instance, Kuo's patent respectfully does not show, much less teach or suggest the frequency doubling phenomena. In contrast, Kuo's patent in Figure 4 (and discussion at Col. 5, lines 46-61) shows an amplitude plot of the error signal which is not a frequency doubled version of the dither. More particularly, Kuo describes a wavelength locking device that incorporates means for dithering the laser output spectrum with a dither signal generator, then samples a portion of the modulated and dithered optical signal; the sampled portion is a feedback signal which is then summed with the original dither to provide a composite signal that is used as the basis for controlling the laser wavelength (see Kuo Figure 2 and column 4, line 40). While the Examiner acknowledges in page 8 of the Office Action (item 7) in his rejection of Claims 31, 39 and 41 (now canceled herein and incorporated in each of amended Claims 30, 38 and 40, respectively) that "Kuo does not disclose the feedback signal as two times a dither modulation frequency", this is not an accidental omission as Kuo is only using a scalar summation in the feedback loop, i.e., his apparatus does not operate on a frequency doubling principle. This is why no frequency doubling is shown in Kuo's Figure 4. The Examiner further alleges that the present invention constitutes discovering an optimum value of a result effect variable; however this is in error. Respectfully, applicants have not simply optimized the apparatus developed by Kuo, instead they have changed a key component in the feedback loop (taking a vector cross product) and operate on a

fundamentally different set of variables as a result. Therefore, it may be respectfully stated that this invention is patentably distinguishable over the prior art of Kuo.

In a second instance, the wavelength locked loop as set forth in the claims covering the various embodiments of the present invention implements a true <u>vector cross product</u> between the sampled optical feedback signal and the original sinusoidal dither (e.g., Claims 11 and 35). Thus, while the Examiner in his rejection of claim 11 on page 4 of the Office Action, identifies element 220 in Kuo as a "mixer" capable of generating a cross product signal whose components represent the sum and difference at dither frequencies, respectfully, the Examiner is mistaken. In fact, this is not the case: Kuo identifies element 220 as a "summer" (see Kuo at column 4, line 58) that combines the signals in a scalar manner, not as a vector cross product as identified in the present invention. The difference is significant; Kuo never uses the term "cross product" or "vector cross product", and does not teach or suggest generation of error signal components at the sum and difference frequencies as in the present invention. Because the present invention implements a true vector cross product, the invention is capable of generating the state diagrams shown in Figures 2-5. Further as described in the present specification at page 12, lines 2-15, the invention uses a servo mechanism capable of generating a frequency doubled error signal when the laser and bandpass filter center wavelengths are congruent. By contrast, Kuo's patent (Kuo, Figure 4) shows the error signal which is not a frequency doubled version of the dither. Furthermore, Kuo's patent is not capable of generating the continuous error signal functions corresponding to the cases where the laser and filter center wavelengths are only partially aligned (as shown in

the present invention state diagrams of Figures 2-5). As described for instance at page 12, line 15 through page 13, line 9, this permits for the generation of a continuous bipolar error signal indicating the direction and amount of wavelength corrections. By contrast, Kuo's patent is a point null approach; as shown in Kuo Figure 4, where the normalized error goes to zero when the laser and filter center wavelengths are congruent.

A further limitation of the Kuo system involves the fact that Kuo's error signal (Figure 4) lies in two regions above and below the zero null point where the slope of the error signal is essentially flat. This limits the ability of Kuo's approach to detect a continuum of error states on either side of the locking point, and also requires a larger amplitude dither modulation to achieve a significant amount of control. By contrast, the present specification describes how to generate a series of error states for a wider dynamic range on either side of the locking point, and requires a smaller amplitude dither in order to achieve a comparable level of wavelength control. Accordingly, the applicants respectfully submit for the Examiner's consideration and request for entry new Claims 45-51 directed to the bi-polar and continuous nature of the error signal such as shown in Figures 5(a)-5(c). This error signal is a continuous bi-polar error function that is capable of being adjusted positive or negative for driving the wavelength of an electromagnetic signal (e.g., optical signal) respectively less than or greater than a center wavelength of the wavelength selective means (e.g., bandpass filter) according to a desired application, e.g., variable attenuation, dynamic gain etc.). Likewise, this continuous bi-polar error function is capable of being adjusted positive or negative for adjusting the passband wavelength of the wavelength selective means (e.g., bandpass filter) according to a

desired application. Original support is found for these new Claims in the specification (e.g., pages 12, lines 24-et seq., and pages 14-16) and the continuous nature of the bi-polar error signal is shown in Figures 5(a)-5(c) and 6(a)-6(c). Respectfully, no new matter is being entered.

For all of the following reasons, it is respectfully requested that Kuo does not anticipate the present invention as claimed in independent claims 1, 18, 21, 28, 30, 38 and 40 and the rejections of independent Claims 1, 18, 21, 28, 30, 38 and 40 under 35 U.S.C. §102(b) have been obviated by the above amendments; therefore reconsideration and withdrawal thereof and of all claims directly or indirectly dependent thereon are respectfully requested.

In addition, as set forth in independent Claims 18 and 28, the present invention describes an alternative embodiment which involves exploiting the wavelength locked loop phenomena for tuning the optical filter while keeping the laser wavelength fixed. The tuning of the filter device while exploiting the servo mechanism of the invention implementing the <u>frequency doubled error signal</u>, is neither taught nor suggested in Kuo, and the Examiner is respectfully requested to withdraw the rejections of Claims 18 and 28 based on these grounds.

With respect to the rejection of Claim 4 as being unpatentable over Kuo in view of Bianchini et al, respectfully, as stated herein, the present invention implements a fundamentally different principle of operation than Kuo. Consequently, combining Kuo with other art does not yield an RF or microwave embodiment which operates on the same principle as our work, and the Examiner is respectfully requested to withdraw the

A

rejection of Claim 4 based on these grounds.

With respect to the rejection of Claim 10 as being unpatentable over Kuo in view of Hung (work on tunable acousto-optic filters), respectfully, as stated herein, the present invention implements a fundamentally different principle of operation than Kuo and includes a different functional element, namely, a true vector cross product generation which yields frequency doubling. Consequently, combining Kuo with the other art does not yield a tunable filter embodiment which operates on the same principle as the present invention, and the Examiner is respectfully requested to withdraw the rejection of Claim 10 based on these grounds.

As a further difference distinguishing the present invention over the prior art Kuo reference, the Examiner is respectfully requested to consider the differences between the block diagram in Kuo (Figure 2) and those in the present application (Figures 1, 7, and 8-12). Note that the present Figure 7 denotes a vector cross product including a time averaged integral to generate the bipolar error signal, which is not present in Kuo. Also, it is noted that the embodiment described in Kuo generates a bipolar error signal, however, using a different apparatus and method than the present invention. Further, applicants respectfully submit that the present invention provides a continuous state machine for detecting the magnitude and direction of wavelength offset from the locking point as shown in Figures 2-6, which means that the present invention has a wider locking range; by contrast Kuo discusses the requirement of an available window for his method to work, including a coarse wavelength tuning which must first be conducted in order to get the laser wavelength near the locking point. Kuo also does not describe specifically

how to overcome uncertainty in the null point (figure 4) due to noise or other random variances in the system. By contrast, the present invention's implementation of the wavelength locked loop principle provides a unique frequency doubled signature at lock, which is significantly more robust to resisting noise that would cause the Kuo method to drift away from the zero null point. The methods of the present invention also lend themselves to first, second, or higher order derivative techniques for sensitivity enhancements, which is not possible using Kuo's method.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment.

In view of the foregoing remarks herein, it is respectfully submitted that this application is in condition for allowance. Accordingly, it is respectfully requested that this application be allowed and a Notice of Allowance be issued.

If the Examiner believes that a telephone conference with the Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is requested to telephone the undersigned.

Respectfully submitted,

Steven Fischman
Registration No. 34,594

SCULLY, SCOTT, MURPHY & PRESSER
400 Garden City Plaza
Garden City, New York 11530
(516) 742-4343
SF:gc

Serial No.: 09/865,256 Docket: FIS920010069US1 (14401)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please cancel Claim 31, 39 and 41 without prejudice:

Please amend Claims 1, 18, 21, 25, 28, 30, 35, 38, 40 and 42 as follows:

1. (Amended) A wavelength-locked loop servo-control circuit that enables real time mutual alignment of an electromagnetic signal having a peaked spectrum function including a center wavelength and a wavelength selective [device] means for implementing a peaked passband function including a center wavelength, in a system employing electromagnetic waves, said circuit comprising:

[mechanism] means for applying a dither modulation signal at a dither modulation frequency to said electromagnetic signal to generate a dither modulated electromagnetic signal, and inputting said dither modulated electromagnetic signal to said wavelength selective [device] means;

[mechanism] means for converting a portion of said dither modulated electromagnetic signal to an electric feedback signal;

[mechanism for continuously comparing said feedback signal with said dither modulation signal and] means for generating an error signal [representing a difference] comprising a

A

vector cross product of [between a frequency characteristic of] said feedback signal and [a] said dither modulation [frequency] signal; and

[mechanism] means for adjusting the peak spectrum function of said electromagnetic signal according to said error signal, wherein said center wavelength of said electromagnetic signal [and] becomes aligned with said center wavelength of said wavelength selective means [device center wavelength become aligned] when [said] a frequency characteristic of said feedback signal is two times said dither modulation frequency.

11. (Amended) The wavelength-locked loop servo-control circuit as claimed in Claim 7, wherein said [device for comparing] means for generating an error signal comprising a vector cross product includes a mixer capable of combining said converted feedback signal with said sinusoidal dither modulation signal and generating a vector cross-product signal having components representing a sum and difference at dither frequencies.

18. (Amended) A wavelength-locked loop servo-control circuit that enables real time mutual alignment of an electromagnetic signal having a peaked spectrum function including a center wavelength and a tunable wavelength selective [device] means for implementing a peaked passband function including a center wavelength, in a system employing electromagnetic waves, said circuit comprising:

[mechanism] <u>means</u> for applying a dither modulation signal at a dither modulation frequency to said tunable wavelength selective [device] <u>means</u>, said tunable wavelength selective [device] <u>means</u> further receiving an electromagnetic signal having a center wavelength and generating a dither modulated optical signal for output thereof;

[mechanism] <u>means</u> for converting a portion of said dither modulated electromagnetic signal to an electric feedback signal;

[mechanism for continuously comparing said feedback signal with said dither modulation signal and] <u>means for</u> generating an error signal <u>comprising a vector cross product of</u> [representing a difference between a frequency characteristic of] said feedback signal and [a] <u>said</u> dither modulation [frequency] <u>signal</u>; and

[mechanism] <u>means</u> for adjusting a passband center wavelength of said tunable wavelength selective [device] <u>means</u> according to said error signal, wherein said center wavelength of said electromagnetic signal <u>becomes aligned with said center wavelength of</u> [and] said tunable wavelength selective <u>means</u> [device center wavelength become aligned] when [said] <u>a</u> frequency characteristic of said feedback signal is two times said dither modulation frequency.

21. (Amended) A method for mutually aligning a center wavelength of an electromagnetic signal [of] having a peaked spectrum function with a center wavelength of a wavelength selective [device] <u>means for</u> implementing a peaked passband function <u>including a center</u>

wavelength, in a system employing electromagnetic waves, said method comprising the steps of:

a) applying a dither modulation signal at a dither modulation frequency to said electromagnetic signal operating at a specific wavelength, and inputting said dither modulated electromagnetic signal to said wavelength selective [device] means having a peak frequency response at a desired wavelength;

b) converting a portion of said dither modulated electromagnetic signal to an electric feedback signal;

c) [continuously comparing said feedback signal with said dither modulation signal and] generating an error signal comprising a vector cross product of [representing a difference between a frequency characteristic of] said feedback signal and [a] said dither modulation [frequency] signal; and

d) adjusting the peak spectrum function of said electromagnetic signal according to said error signal, wherein said center wavelength of said electromagnetic signal becomes aligned with said center wavelength of [and] said wavelength selective means [device center wavelength become aligned] when said frequency characteristic of said feedback signal is two times said dither modulation frequency.

25. (Amended) The method as claimed in Claim 21, wherein said generating [continuously comparing] step c) includes the steps of:

combining said converted feedback signal with said dither modulation signal and generating a vector cross-product signal having components representing a sum and difference at dither frequencies.

filtering said output cross-product signal; and

averaging said output cross-product signal to generate said error signal, said error signal being positive or negative depending on whether a center wavelength of said electromagnetic signal is respectively less than or greater than said desired wavelength of said wavelength selective device.

28. (Amended) A method for mutually aligning a center wavelength of an electromagnetic signal of having a peaked spectrum function with a center wavelength of a wavelength selective [device] means for implementing a peaked passband function including a center wavelength, in a system employing electromagnetic waves, said method comprising the steps of:

a) applying a dither modulation signal at a dither modulation frequency to said tunable wavelength selective device, said tunable wavelength selective [device] means further

receiving an electromagnetic signal having a center wavelength and generating a dither modulated electromagnetic signal for output thereof;

b) converting a portion of said dither modulated electromagnetic signal to an electric feedback signal;

c) [continuously comparing said feedback signal with said dither modulation signal and] generating an error signal comprising a vector cross product of [representing a difference between a frequency characteristic of] said feedback signal and [a] said dither modulation signal [frequency]; and

d) adjusting a passband center wavelength of said tunable wavelength selective [device] means according to said error signal, wherein said center wavelength of said electromagnetic signal becomes aligned with said center wavelength of [and] said tunable wavelength selective means [device center wavelength become aligned] when said frequency characteristic of said feedback signal is two times said dither modulation frequency.

30. (Amended) A servo-control circuit for tuning a laser signal generator providing an optical signal at a specified wavelength in an optical system, said optical system including a bandpass filter [device] means for receiving and transmitting optical signals in said optical system at a desired wavelength, said servo-control system comprising:

[device] means for applying a bias signal to said laser signal generator for tuning said optical signal to a specific wavelength;

[device] means for applying a dither modulation to said bias signal to produce a dither modulated optical signal, said dither modulated optic signal being input to said bandpass filter [device] means;

detector [device] means for receiving said dither modulated optical signal output from said bandpass filter [device] means and converting said received optical signal into an electrical feedback signal; and,

[device for continuously comparing frequency characteristics of said converted feedback signal against frequency characteristic of a dither modulation signal and] means for generating an error signal comprising a vector cross product of said converted feedback signal and a dither modulation signal [therefore], said error signal responsively modifying the bias signal until [a predetermined relation exists between] a frequency characteristic of said converted feedback signal is two times a [and a] dither modulation frequency, whereby at such time [when said predetermined relation exists,] said wavelength of said optical signal exactly matches the desired wavelength of said [wavelength selective device] bandpass filter means.

35. (Amended) The servo-control circuit for tuning a laser signal generator as claimed in Claim 30, wherein said [device for comparing] means for generating an error signal includes:

a mixer capable of combining said converted feedback signal with said dither modulation signal and generating a vector cross-product signal having components representing a sum and difference at dither frequencies;

a low-pass filter device for filtering said output cross-product signal; and

an integrator circuit for averaging said output cross-product signal to generate said error signal, whereby said error signal is positive or negative depending on whether a center wavelength of said optical signal is respectively less than or greater than said desired wavelength of said [wavelength selective device] bandpass filter means.

38. (Amended) A servo-control circuit for tuning a tunable wavelength selective [device] means for [capable of] receiving and transmitting optical signals of a desired wavelength in an optical system, said servo-control system comprising:

[mechanism] means for applying a dither modulation signal at a dither modulation frequency to said tunable wavelength selective [device] means, said tunable wavelength selective [device] means further receiving said optical signal having a center wavelength and generating a dither modulated optical signal for output thereof;

[mechanism] means for converting a portion of said dither modulated optical signal to an electric feedback signal;

[mechanism for continuously comparing said feedback signal with said dither modulation signal and] means for generating an error signal comprising a vector cross product of [representing a difference between a frequency characteristic of] said feedback signal and a dither modulation [frequency] signal; and

[mechanism] means for adjusting a passband center wavelength of said tunable wavelength selective [device] means according to said error signal until [a predetermined relation exists between] a frequency characteristic of said converted feedback signal is two times [and] said dither modulation frequency, whereby at such time [when said predetermined relation exists,] said desired wavelength of said tunable wavelength selective [device] means exactly matches a wavelength of said input optical signal.

40. (Amended) A method for tuning a laser signal generator providing an optical signal at a specified wavelength in an optical system, said optical system including a bandpass filter [device] means for receiving and transmitting optical signals in said optical system at a desired wavelength, said method comprising the steps of:

a) applying a bias signal to said laser signal generator for tuning said optical signal to a specific wavelength;

b) applying a dither modulation to said bias signal to produce a dither modulated optical signal, said dither modulated optic signal being input to said bandpass filter [device] <u>means;</u>

c) converting said received optical signal into an electrical feedback signal; and,

d) [continuously comparing frequency characteristics of said converted feedback signal against a frequency characteristic of a dither modulation signal and] generating an error signal <u>comprising a vector cross product of said converted feedback signal and a dither modulation signal</u> [therefore], said error signal responsively modifying the bias signal until [a predetermined relation exists between] a frequency characteristic of said converted feedback signal <u>is two times said</u> [and] dither modulation frequency, whereby <u>at such time</u> [when said predetermined relation exists,] said wavelength of said optical signal exactly matches the desired wavelength of said [wavelength selective device] <u>bandpass filter means</u>.

42. (Amended) The method for tuning a laser signal generator as claimed in Claim 40, wherein said [continuously comparing] <u>generating</u> step d) includes the steps of:

combining said converted feedback signal with said dither modulation signal and generating a <u>vector</u> cross-product signal having components representing a sum and difference at dither frequencies.

filtering said output cross-product signal; and

averaging said output cross-product signal to generate said error signal, said error signal being positive or negative depending on whether a center wavelength of said optical signal is respectively less than or greater than said desired wavelength of said wavelength selective device.

Please add new Claims 45-51

45. (New) The wavelength-locked loop servo-control circuit as claimed in Claim 1, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for driving said center wavelength of said electromagnetic signal respectively less than or greater than said center wavelength of said wavelength selective means according to a desired application.

46. (New) The wavelength-locked loop servo-control circuit as claimed in Claim 18, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for driving said center wavelength of said tunable wavelength selective means respectively less than or greater than said center wavelength of said electromagnetic signal according to a desired application.

47. (New) The method as claimed in Claim 21, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for driving said center wavelength of said electromagnetic signal respectively less than or greater than said center wavelength of said wavelength selective means according to a desired application.

48. (New) The method as claimed in Claim 28, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for driving said center wavelength of said tunable wavelength selective means respectively less than or greater than said center wavelength of said electromagnetic signal according to a desired application.

49. (New) The servo-control circuit for tuning a laser signal generator as claimed in Claim 30, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for modifying the bias signal to obtain an optical signal having a wavelength respectively less than or greater than said desired wavelength of said bandpass filter means according to a desired application.

50. (New) The servo-control circuit for tuning a tunable wavelength selective device as claimed in Claim 38, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for modifying the passband wavelength respectively less than or greater than said center wavelength of said tunable wavelength selective means according to a desired application.

51. (New) The method for tuning a laser signal generator as claimed in Claim 40, wherein said error signal is a continuous bi-polar error signal function capable of being adjusted positive or negative for modifying the bias signal to obtain an optical signal having a wavelength respectively less than or greater than said desired wavelength of said bandpass filter means according to a desired application.